

## Review: Tales from Both Sides of the Brain

By Theodor Landis, M.D.

*Our brain has two hemispheres that specialize in different jobs—the right side processes spatial and temporal information, and the left side controls speech and language. How these two sides come together to create one mind is explained by pioneering neuroscientist Michael Gazzaniga in his new book, Tales from Both Sides of the Brain : A Life in Neuroscience (Ecco/Harper Collins, 2015). Gazzaniga is director of the SAGE Center for the Study of the Mind at the University of California, Santa Barbara, and a Dana Alliance member.*

**M**ichael S. Gazzaniga, one of the most important and leading figures in cognitive neuroscience, presents a brilliant and very lively autobiography that covers his contributions to one of the most puzzling and fascinating experiments in science: the disconnection of the two hemispheres of the brain in living patients.

As a young Ph.D. candidate in 1962, Gazzaniga was the right man at the right place: the California Institute of Technology, part of a group led by Roger Sperry, who later was awarded the Nobel Prize. Gazzaniga's description of his first experiment, which showed that the non-speaking, right cerebral hemisphere of his first "split-brain" patient understood the meaning of words, is as captivating as a thriller.

The "disconnectionist" approach to understanding brain functioning had begun with observations by the French neurologist Jules Dejerine, published in 1892, and by the German neurologist Hugo Liepmann, in 1900. These described the different functioning of the partly disconnected left and right cerebral hemispheres. Their work and others' paved the way for the Caltech experimenters' ultimate and complete "split" of the brain

Gazzaniga begins his tale by recounting how, as an undergraduate at Dartmouth, he read of Sperry's work and became interested in the split-brain concept. He describes how patients with split brains differ from "normal," neurological patients, and how he used his knowledge of the split brain to explore a possible new window into the "unconscious."

Together with Bruce Volpe and Joseph LeDoux, a former student, Gazzaniga discovered in 1979 a way in which information that could not be accessed consciously could nevertheless influence seemingly conscious decisions. They thus opened a new field of cognitive research.

Gazzaniga describes the key experiments (why and how they came about, the fulfilled and unfulfilled expectations, and the differences between patients), and provides URLs to online videos of key experiments with some of his split-brain patients. These videos depict a condition that hasn't been fully explored, though it may be essential for understanding the self and the human mind.

Gazzaniga explains complex experiments and scientific discoveries in a simple, easy-to-understand manner. He makes important observations about the behavior of split-brain patients—observations that have never appeared before in the scientific literature. Many cognitive neuroscientists will surely use his observations to reflect on questions of neuroscience that have never been resolved.

Gazzaniga's account of the discovery of how split brains manage to "communicate" (by ingenious cross cueing) is fascinating. It also demonstrates how easily a researcher, confronted with the peculiar scenario of a split brain, in search of unification, can miss the hemispheres' extra-callosal transfer of information and thus draw erroneous conclusions concerning mental integration.

Gazzaniga goes on to describe the amazing capacities of the non-speaking right cerebral hemisphere, and the wild confabulations of the speaking left hemisphere when asked to explain actions and decisions of its disconnected partner.

This book is also a tale of how science can be original and fun. For example, Gazzaniga in the course of his investigations converted a family van/trailer into a first-rank psychophysics-neuropsychology laboratory—allowing him and his team to test split-brain patients at their own homes.

Above all, Gazzaniga's story is about friendships, opportunities, academic and political encounters, and his many moves around the country to pursue intriguing opportunities. Gazzaniga's encounters with interesting and open-minded researchers, including the book's Foreword contributor, Steven Pinker, read like a Who's Who of neuroscience.

Like some other famous cognitive neuroscientists of his era, Gazzaniga mentored a generation of new investigators in the field, many of whom have made huge contributions as well. The generous way in which he describes his relationships with former superiors, fellows, collaborators, postdocs, and students somehow defies his modest contention that he is an ungifted teacher.

The book is also a bit of a travelogue, as Gazzaniga traces his Italian heritage, great sense of hospitality, and love for food and wine. We learn that he often applied these traits in the name of science to organize lively scientific discussions in exotic locations, such as Venice, Tahiti, and Turkey. Out of these brainstorming conferences have come new ideas and experiments, a network of lifelong friends, and indeed an entire research community.

Gazzaniga's brilliant coining of the term "cognitive neuroscience" has helped create an intellectual home for researchers and clinicians trained in many other fields—from neuropsychology to philosophy and artificial intelligence.

Gazzaniga's book illuminates his flair for showmanship, which led him as a graduate student at Caltech to organize "on stage" political debates, on controversial topics, with politically opposed but witty commentators. Participants included TV personality Steve Allen, JFK biographer James MacGregor Burns, and leading conservative William F. Buckley, Jr. He notes that one debate even attracted Mr. and Mrs. Groucho Marx.

In 1989 Gazzaniga co-founded (with his wife of 33 years, Charlotte) the quarterly *Journal of Cognitive Neuroscience*, which has steadily risen in impact, and is now a forum for work from all perspectives and sub-fields within cognitive neuroscience. His *Cognitive Neuroscience: A Reader* (Wiley, 2000) also has become the standard textbook in the field.

At the end of his autobiography Gazzaniga asks an important question: "How does the brain enable mind?"

He notes, in reference to the question, that there has been a revolution in neuroimaging and functional neuroimaging techniques, which now include CT scans; PET and SPECT scans with an ever increasing number of ligands; MRI scans with increasing magnetic field strengths and finer resolutions; MEG and three-dimensional EEG; deep brain recordings; and deep brain stimulations. He also cites an exponential increase in papers on cognitive neuroscience in animals, healthy humans, and patients.

However, despite this tremendous effort and progress, we still seem a long way from being able to explain how neurons produce “mind.” Maybe the lifelong fascination of Gazzaniga with the patients who have disconnected brains is still the best way to test mind, but of course, only the divided mind.

### **Bio**

**Theodor Landis**, M.D., is honorary professor of neurology at the University of Geneva, Switzerland and former chair of the university’s Department of Clinical Neurosciences. He is a behavioral neurologist with a special interest in cerebral hemispheric specialization and dual brain interaction. Landis studied medicine in Zürich and did his postgraduate and postdoctoral training in neurology and behavior neurology in Zürich, Bern, and Lausanne in Switzerland, as well as at the National Hospital, Queen Square, London, and the VA Medical Center’s Aphasia Research Center in Boston. He is author or co-author of over 300 scientific peer reviewed publications.